

ABSTRACT

An electrochemical cell including a cathode, an electrolyte in ionic contact with the cathode, and an anode in physical contact with the electrolyte, wherein the anode contains a controlled release anode composition that includes at least a first anode active material and at least a first controlled release agent in physical contact thereto for tentatively isolating the first anode active material from the electrolyte in the beginning of a cell operation for a delayed reaction of the first anode active material. Preferably, the anode further contains an initial-stage anode active material in direct contact with the electrolyte. Such a controlled release anode can be used in a variety of electrochemical cells including metal-air batteries, such as a zinc-air battery, for an extended period of operating time.